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THE UNIVERSITY OF LEEDS

AND THE

YORKSHIRE COUNCIL FOR AGRICULTURAL EDUCATION.

A

REPORT

ON

EXPERIMENTS WITH POTATOES,

1907.

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COUNTY LECTURES.

THE UNIVERSITY OF LEEDS, on behalf of the County Councils of the East, North and West Ridings of Yorkshire, will provide Courses of Instruction in the following subjects throughout the ensuing year:—

I. Results of the Garforth and other experiments in the County.

II. Agriculture.

III. Horticulture.

IV. Poultry Keeping.

V. Farriery.

Application should be made as early as possible, to "The Clerks, Joint Agricultural Council," addressed for the East Riding, to "The County Hall, Beverley"; for the North Riding, to "The County Offices, Northallerton"; and for the West Riding, to "The County Hall, Wakefield."

Applications may also be addressed to "The Professor of Agriculture, The University, Leeds."

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The University of Leeds

AND THE

Yorkshire Council for Agricultural Education.

A REPORT

ON

EXPERIMENTS WITH POTATOES,

1907.

The Experiments with Potatoes conducted during 1907, except those relating to the manuring of the crop, are discussed under the following headings :—

1. The relative merits of a number of Varieties of Potatoes, including Early, Second-Early, and Late Varieties.

2. Disease-resisting Varieties.

3. The relative merits of seed raised in England, Scotland, and Ireland.

4. The effect of a local change of soil upon the productiveness of the Potato.

5. Scab on Potatoes.

The tests were carried out in Field 27 on medium loam soil. The previous crop was barley, grown after oats. Spring was favourable for planting, but the months of May, June, and July were unusually wet and lacking in warmth and sunshine. Frost on July 1st badly damaged the young Potato plants, and, although a recovery was made, the weather throughout almost the entire growing period continued very ungenial, with the result that the Varieties never attained that degree of vigour which gives promise of an abundant yield. On September 4th, six degrees of frost were registered. This so damaged the haulm of the late Varieties, that further growth was impossible and the yields were, no doubt, adversely affected in consequence.

Appended is a comparative statement of the Rainfall and Sunshine at Garforth in 1906 and 1907, during that period of the year in which Potatoes make their growth.

	RAINFALL (in Inches).		SUNSHINE (in Hours).	
	1906.	1907.	1906.	1907.
April	0.78	1.41	195.2	120.4
May	1.92	3.50	103.8	124.0
June	1.13	2.93	197.9	142.7
July	1.22	2.45	187.4	147.2
August	1.74	1.90	156.9	126.2
September ..	0.71	0.64	155.4	152.0
October.. ..	4.46	5.49	70.6	70.5
Total ..	11.96	18.32	1067.2	883.0

It will be seen that the rainfall from April to October in 1907, was greatly in excess of that in the same period of 1906, and also that the amount of sunshine in 1907 was much less than in the corresponding period of 1906.

MANURIAL TREATMENT. 15 tons of dung per acre were applied in the row at planting time. No artificial manures were given.

1. THE RELATIVE MERITS OF A NUMBER OF VARIETIES OF POTATOES.

(1) First-Early Varieties.

DATE OF PLANTING. The Potatoes were planted on April 17th.

PARTICULARS REGUARDING THE SEED. Whole tubers, about the size of a hen's egg, were planted. The seed had been retained from the crops grown from new seed at Garforth in 1906, and had been stored throughout the Winter of 1906-07 in boxes in a cool well-lighted shed. At planting time MIDLOTHIAN EARLY was the most advanced in sprouting, the sprouts being about $\frac{1}{2}$-inch long and very sturdy and uniform. The sprouts of the other Varieties were not more than $\frac{1}{4}$-inch in length.

DATE OF LIFTING. The Varieties were lifted during the period October 3rd to 15th. They had been ripe for some time, but the wet Summer having delayed the other work on the farm, lifting had to be postponed till after the corn harvest.

Each plot was 1/40 acre in extent, but in the following table the yield is given per acre :—

First-Early Varieties.

VARIETY.	YIELD PER ACRE.			
	Ware and Seed.	Chats.	Diseased.	TOTAL.
	Tons. cwts. qrs.	Tons. cwts. qrs.	Tons. cwts. qrs.	Tons. cwts. qrs.
Midlothian Early	4 19 1	0 17 1	0 0 1	5 16 3
Recorder	3 13 1	1 2 3	trace	4 16 0
Ringleader ..	3 0 3	1 2 2	0 0 1	4 3 2
Harbinger ..	1 17 3	0 17 3	0 0 1	2 15 3

These results, considered in conjunction with those obtained in previous trials, warrant the conclusion that Ringleader and Harbinger are comparatively little suited to climatic conditions such as prevail at Garforth.

Cooking Quality of the First-Early Varieties.

VARIETY.	Colour. Maximum Marks. 15.	Flavour. Maximum Marks. 20.	Flouriness. Maximum Marks. 15.	TOTAL MARKS. Maximum 50.
Recorder	14	18	14	46
Ringleader	14	18	13	45
Harbinger	13	17	13	43
Midlothian Early ..	13	17	13	43

The following crops have been obtained from NEW SEED :—

VARIETY.	SOURCE OF SEED.	YIELD PER ACRE.			
		Ware and Seed.	Chats.	Diseased.	TOTAL.
		Tons. cwts. qrs.	Tons. cwts. qrs.	Tons. cwts. qrs.	Tons. cwts. qrs.
Midlothian Early..	Dobbie, Scot.	6 5 1	1 16 2	0 2 1	8 4 0
Recorder	Dennis, Eng.	5 8 1	1 6 3	nil	6 15 0

(2) Later Early Varieties.

In 1906, at the request of the Department of Agriculture for Ireland, new English, Scotch, and Irish seed of Ninetyfold was tested at Garforth. Sufficient seed for a further test in 1907 was retained from the crops grown in 1906, and the result is given in the table below. Sir John Llewelyn was likewise grown at Garforth in 1906 and 1907.

At planting time the following notes were made :—

"The Scotch and Irish seed are much alike in every respect, having sturdy uniform sprouts about ¼-inch long. The English seed is sound, but the sprouts are much less sturdy and vigorous. The sprouts of Sir John Llewelyn are not uniform, some being 1-inch long whilst the majority are under ¼-inch."

The crops obtained in 1907 were as follows :—

VARIETY.	YIELD PER ACRE.			
	Ware and Seed.	Chats.	Diseased.	TOTAL.
	Tons. cwts. qrs.	Tons. cwts. qrs.	Tons. cwts. qrs.	Tons. cwts. qrs.
Ninetyfold (Ireland)	8 0 3	1 6 2	0 7 2	9 14 3
Ninetyfold (Scotland)	7 8 1	1 11 2	0 10 1	9 10 0
Ninetyfold (England)	4 2 2	0 19 1	0 5 0	5 6 3
Sir John Llewelyn ..	3 6 2	1 4 0	trace	4 10 2

In 1906, with freshly imported seed, that from Ireland gave practically as good a crop as the Scotch seed. In the second year the yields are again about equal. In both years the English seed has been much less productive than the Scotch and Irish seed.

Ninetyfold is somewhat later in reaching maturity than the EARLY VARIETIES already referred to, but as a prolific Variety considerably earlier than, *e.g.*, British Queen, it is distinctly superior to Sir John Llewelyn.

Cooking Quality of the Later Early Varieties.

VARIETY.	Colour. Maximum Marks. 15.	Flavour. Maximum Marks. 20.	Flouriness. Maximum Marks. 15.	TOTAL MARKS. Maximum 50.
Sir John Llewelyn ..	13	17	13	**43**
Ninetyfold (Scotland)	13	18	12	**43**
Ninetyfold (England)	12	17	13	**42**
Ninetyfold (Ireland)	13	16	13	**42**

(3) Second-Early and Main Crop Varieties.

The following list of Varieties tested in 1907 includes those that have proved most profitable in trials extending back to 1898 and also several of the most recent introductions :—

SECOND-EARLIES. British Queen, British Queen No. 2, Dalmeny Gem, Dalmeny Radium, Royal Kidney.

MAIN CROP VARIETIES. Dalmeny Argon, Dalmeny Helium, Dalmeny Regent, Duchess of Cornwall, Eldorado, Factor, Northern Star, Up-to-Date, Wonder.

There was a duplicate test in the County as in previous years, and we are greatly indebted to Mr. Riley Briggs, of Osgodby Hall, Selby, for conducting this test in 1907.

PARTICULARS REGARDING THE SEED. Seed of all the Varieties tested in 1907 was procured in 1906 as far as possible from the raisers, and was grown at Garforth in that year under the same manurial and soil conditions. Seed for the test in 1907 was retained from the crops in 1906, and stored in boxes at Garforth throughout the Winter.

At planting time the tubers of most of the Varieties had only just started to sprout and there was nothing very noticeable to report except that in the case of Eldorado the sprouts were uneven in length and rather attenuated. The tubers themselves were fresh and sound.

MANURIAL TREATMENT. The manurial treatment at Garforth has already been stated (p. 4.) At Osgodby 22 tons (approximately) of Dung per acre were applied in the rows and no artificial manures were given.

DATES OF PLANTING. The Potatoes were planted at Osgodby on March 22nd, and at Garforth on April 18th and 20th.

Owing, doubtless, to the cold, wet Summer many of the Varieties grew slowly and at no time looked promising. In fact the Varieties of the Up-to-Date type were almost the only ones that possessed that luxuriance of haulm which farmers so much like to see.

DATES OF LIFTING. The Potatoes were lifted at Garforth between October 15th and November 2nd, and at Osgodby on November 4th and 6th.

The area of each plot was 1/40 acre, except when otherwise stated, but the yields are stated in the following Table at the rate per acre.

Second-Early and Main-Crop Varieties.

NAME OF VARIETY.	YIELD PER ACRE.					
	GARFORTH.			OSGODBY.		
	Total Crop. Per Acre.	Per-centage of Ware.	Weight of Diseased Tubers. Per Acre.	Total Crop. Per Acre.	Per-centage of Ware.	Weight of Diseased Tubers. Per Acre.
	Tons. cwts. qrs		Tons. cwts. qrs.	Tons. cwts. qrs.		Tons. cwts. qrs.
*Dalmeny Regent ..	12 12 1	67	0 4 0	Not grown		
*Duchess of Cornwall	11 15 3	67	0 2 3	,,		
Northern Star ..	11 6 0	61	nil	8 2 2	80	nil
Up-to-Date	11 0 3	74	0 10 0	7 1 2	83	0 15 3
British Queen, No. 2	10 15 0	63	0 2 2	7 10 1	83	0 4 3
*†Dalmeny Helium ..	10 14 1	76	0 10 3	Not grown		
Dalmeny Radium ..	10 7 2	47	0 2 2	8 10 1	84	0 6 0
*†Dalmeny Argon ..	10 3 2	64	0 9 1	Not grown		
*Factor	9 10 0	67	0 9 0	,,		
*Wonder	8 8 1	69	0 5 1	6 3 1	86	0 9 1
†Dalmeny Gem ..	7 2 2	56	0 5 1	Not grown		
†Eldorado	5 16 1	55	trace	,,		
Royal Kidney ..	Not grown			7 17 1	84	nil
British Queen ..	,,			7 6 0	82	0 5 3

* Of the Up-to-Date type.
† Area of plot less than 1/40 acre.

It will be seen that Varieties of the Up-to-Date type are still the most profitable for main crop purposes. Northern Star, however, has certain commendable characteristics. It is a vigorous grower and a remarkably good resister of disease. The stock which produced the seed for the above test was procured from a Yorkshire source in 1906, and has consequently been grown longer in England than that of Dalmeny Regent or Duchess of Cornwall, the stock of which was obtained from Scotland in 1906. Moreover the plants of Northern Star throughout the plot were, this year, unusually uniform in type. It must, however, be admitted that it produces too large a proportion of seed-size tubers.

The best Second-Early Varieties are British Queen No. 2—an improved type of the old British Queen—and Dalmeny Radium, which is also of the British Queen type.

Eldorado came originally from Scotland in 1906, and was grown from whole seed under the same conditions as the others in that year. Whole seed, just as was the case with the other Varieties, was retained from the crop of 1906, and planted in 1907. The Variety in 1907 grew very unevenly, an occasional good plant being interspersed between short stretches of poor stunted plants.

Cooking Qualities of the Second-Early and Main Crop Varieties.

In the following Table particulars are given of the cooking quality of these Varieties.

VARIETY.	Colour. Maximum Marks. 15.	Flavour. Maximum Marks. 20.	Flouriness. Maximum Marks. 15.	TOTAL MARKS. Maximum. 50.
British Queen, No. 2	14	19	14	**47**
Wonder	14	18	14	**46**
Up-to-Date	14	18	14	**46**
Dalmeny Argon ..	14	17	14	**45**
Dalmeny Helium ..	14	18	13	**45**
Dalmeny Regent ..	14	17	14	**45**
Dalmeny Gem ..	14	17	13	**44**
Dalmeny Radium ..	13	18	13	**44**
Northern Star ..	13	17	13	**43**
Duchess of Cornwall	13	15	14	**42**
Factor	13	16	13	**42**
Eldorado	9	11	9	**29**

With the exception of Eldorado, which had a dark, soapy appearance, and a objectionable, rank flavour, the Varieties cooked satisfactorily. British Queen No. 2 was quite an outstanding first, but there was practically little difference between the merits of the other Varieties.

New Seed of some of the best cropping Varieties in previous trials, and of some other Varieties recently introduced, was also planted in the same field, but on comparatively heavy soil. A portion (1/120 acre) of each was weighed, and the yields stated at rate per acre are given below.

SECOND-EARLY AND MAIN CROP VARIETIES.

(NEW SEED).

VARIETY.	Source of Seed.	Total Crop per acre.	Per-centage of Ware.	Weight of Diseased Tubers per acre.
		Tons. cwts. qrs.		Tons. cwts. qrs.
Northern Star ..	Findlay, Scot. ..	12 14 0	37	nil
*Diamond Reef ..	,, ,, ..	12 11 1	—	1 1 3
Up-to-Date	,, ,, ..	11 4 0	42	0 2 1
British Queen, No. 2	,, ,, ..	11 1 3	51	0 1 0
Dalmeny, Radium	Dalmeny ,, ..	9 4 1	45	0 4 1
Auctioneer	Brown, Strensall	8 10 1	65	0 9 3
Stuntney King Cole	Ambrose, Ely ..	7 11 0	53	0 1 0
Professor Maercker	Germany	7 0 1	53	nil
Daisy..	Holland.. ..	5 13 2	40	nil
Professor Wohltmann	Germany ..	5 13 2	53	nil
Apollo	,, ...	4 7 3	43	nil
Stuntney Surprise ..	Ambrose, Ely ..	3 1 0	14	nil

* Area of portion weighed = $\frac{1}{360}$ Acre.

Northern Star has given the biggest total yield, but of this, as will be seen on glancing at the percentage column, much consisted of small Potatoes. There was no extraordinary amount of chats, but there was a big proportion of seed-size Potatoes. This Variety requires longer than, *e.g.*, Up-to Date, to reach maturity, and the past wet and cold Summer told adversely against it. It is, nevertheless, a Variety that should not be lost sight of.

The haulm and tubers of Diamond Reef closely resemble those of Royal Kidney. In the produce there was far too big a proportion of small Potatoes, and although this Variety was lifted on September 30th—more than a month before most of the others—a big proportion of the crop was diseased.

Auctioneer was obtained for trial from Mr. Brown, Strensall, York. The tubers sent were big and exceedingly handsome, and were more or less oval in shape. The haulm was of the Up-to-Date character, but was much shorter and more procumbent than that of Up-to-Date grown alongside from fresh Scotch seed. The produce consisted of a comparatively big proportion of ware, as will be seen from the percentage column of the Table.

Reference to other Varieties in the above Table is made under the next heading.

2. DISEASE-RESISTING VARIETIES.

Extensive trials with a large number of Varieties of Potatoes, procured from many parts of the world, have been carried out in America, with the object of ascertaining what Varieties are most resistant to disease. Apollo and Professor Wohltmann, two German Varieties, and Daisy, a Dutch Variety, were found practically to be proof against disease.

With the object of testing these Varieties at Garforth, seed was obtained from Germany and Holland, but in consequence of delay in transit, it was not planted at Garforth until April 25th, five days later than the seed of the other Varieties. Seed of Professor Maercker, direct from Germany, was also included in the test.

The test was carried out on rather heavy soil, and the Varieties were not lifted until November 12th. These facts, taken into consideration with the wet character of the past season, show that the test as relating to the power of the Varieties to resist disease was a genuinely severe one. It is true that the crops produced by these Varieties were comparatively poor, but on the other hand there was not the least speck of disease on the tubers. It is possible that, next year, seed from these crops may prove more productive than it has been in its first year in England.

3. THE RELATIVE MERITS OF SEED RAISED IN ENGLAND, SCOTLAND, AND IRELAND.

In 1906, at the request of the Department of Agriculture for Ireland, English, Scotch, and Irish-grown seed of three Varieties, viz., Ninety-Fold, British Queen, and Up-to-Date was grown at Garforth under uniform conditions, so that the merits of the three sources might be compared. In every case the English-grown seed gave the poorest yields. With Ninety-Fold and Up-to-Date, Scotland proved a slightly better source than Ireland, but with British Queen, Ireland was considerably better than Scotland. Seed from the crops of two of the Varieties grown in 1906 was retained and planted in 1907, and the resulting yields of this stock are given in the Table on the next page.

A test similar to that of 1906 was conducted in 1907 with British Queen and Up-to-Date, and their yields will also be found in the Table.

ENGLISH, SCOTCH, AND IRISH SEED.

VARIETY.	ENGLAND.			SCOTLAND.			IRELAND.		
	Total Crop per Acre.	Per-centage of Ware.	Weight of Diseased Tubers. Per Acre.	Total Crop. Per Acre.	Per-centage of Ware.	Weight of Diseased Tubers. Per Acre.	Total Crop. Per Acre.	Per-centage of Ware.	Weight of Diseased Tubers. Per Acre.
	Tons. cwts. qrs.		Tons. cwts. qrs.	Tons. cwts. qrs.		Tons. cwts. qrs.	Tons. cwts. qrs.		Tons. cwts. qrs.
British Queen .. (New Seed)	9 12 3	59	0 0 3	9 15 1	58	0 0 3	11 3 0	49	0 1 0
Up-to-Date .. (New Seed)	7 1 2	64	0 2 3	13 11 0	58	0 0 3	13 10 2	65	0 0 2
British Queen .. (2nd year)	6 16 0	54	0 1 3	4 7 3	42	0 2 1	8 7 3	59	0 5 3
Up-to-Date .. (2nd year)	Not grown			8 5 3	77	0 7 1	8 9 3	78	0 10 0
Ninetyfold .. (2nd year)	5 6 3	77*	0 5 0	9 10 0	78*	0 10 1	9 14 3	82*	0 7 2

* Ware and Seed together.

Just as was the case in 1906, both Scotland and Ireland have proved better sources of seed than England, and for the second time, also, Scotland has proved a better source for Up-to-Date than Ireland, but it is not so good a source for British Queen.

With regard to the yield in the second year, of the three Varieties first grown in 1906, it will be noted that, for some inexplicable reason, British Queen from Scotland has fallen off very considerably, being much poorer than the British Queen from both England and Ireland. As sources of Up to-Date and Ninety-Fold, Scotland and Ireland are practically equal.

Cooking Quality of Potatoes grown from English, Scotch, and Irish Seed.

VARIETY.	Colour. Maximum Marks. 15.	Flavour. Maximum Marks. 20.	Flouriness. Maximum Marks. 15.	TOTAL MARKS. Maximum 50.
British Queen (England)	13	18	14	45
,, ,, (Scotland)	14	18	14	46
,, ,, (Ireland)	14	18	14	46
British Queen (England, 2nd year)	12	18	13	43
,, ,, (Scotland ,,)	14	18	14	46
,, ,, (Ireland ,,)	14	17	14	45
Up-to-Date (England)	14	17	14	45
,, (Scotland)	14	17	14	45
,, (Ireland)	13	17	13	43
Up-to-Date (Scotland, 2nd year) ..	14	18	14	46
,, (Ireland ,,) ..	14	17	14	45

4. THE EFFECT OF A LOCAL CHANGE OF SOIL UPON THE PRODUCTIVENESS OF THE POTATO.

The importance of obtaining Seed Potatoes from a distance, especially from Scotland, is generally recognised, and the preceding section of this Report tends to show that Ireland also may be a suitable source of seed for English farmers. It has even been asserted that if Potatoes are changed yearly from one kind of soil to another, on the same farm, their productiveness will be increased. This, however, is not always the case, as will be seen from the following experiments.

In 1906, new Up-to-Date seed from Scotland was planted at Garforth in two separate fields, one being a low-lying strong clay, and the other a field of medium loam soil. The manures used were the same in each case. A quantity of seed retained from the produce of each field was planted on two adjacent plots on medium loam soil in 1907. The following was the result:—

Experiment, 1907.

VARIETY.	SEED OFF LOAMY SOIL.		SEED OFF CLAY SOIL.		Advantage - Disadvantage - of a Change of Soil.
	Total Crop. Per Acre.	Weight of Diseased Tubers. Per Acre.	Total Crop. Per Acre.	Weight of Diseased Tubers. Per Acre.	
	Tons. cwts. qrs.	Tons. cwts. qrs.	Tons. cwts. qrs.	Tons. cwts. qrs.	Tons. cwts. qrs.
Up-to-Date ..	11 0 3	0 10 0	11 15 1	0 7 3	+0 14 2

The appended Table gives the results of a similar Experiment conducted in 1906:—

Experiment, 1906.

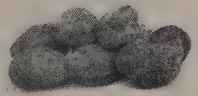
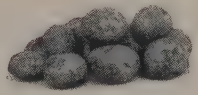
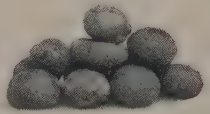
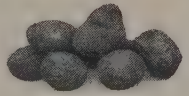
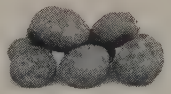
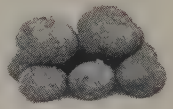
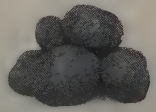
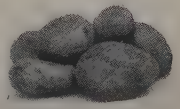
Royal Kidney	12 10 0	nil	11 14 1	0 2 1	−0 15 3
Conquest ..	8 16 1	0 11 3	8 2 1	0 11 3	−0 14 0
Charles Fidler	3 7 3	0 2 2	3 10 1	0 1 0	+0 2 2

The results of these experiments are contradictory, but it must be pointed out that there was a much greater contrast in the soils tested in the second experiment (1907) than in the first (1906), seeing that for the experiment of 1906 the two kinds of soil were in the same field. It may be inferred, however, that a farmer will gain little by adopting this method of "changing" his seed.

5. SCAB ON POTATOES.

There is still much uncertainty as to the cause of Scab. It is found chiefly on dry soils of a sandy or gravelly nature, and is generally almost entirely absent from clayey or peaty soils. It may be, therefore, that there is some relationship between the virulence of the disease and the moisture-holding capacity of the soil. Having this in view, experiments were conducted in 1906 and 1907 with substances that are to a large extent capable of retaining moisture in the soil. Sawdust, peat-moss, shoddy, and rape meal have been tried, separately, and also with salt. The sawdust and peat moss were steeped in water and then applied in the row at planting time, over the sets and before the ridges were "split." The shoddy and rape meal were also applied over the sets, but in a dry condition

SCAB ON POTATOES. 1906.

VARIETY.	UNTREATED.	SAWDUST.	SAWDUST AND SALT.
BRITISH QUEEN ...			
CONQUEST			
UP-TO-DATE			

In 1906, the experiment was carried out on a field at Ellerker, so liable to grow Potatoes affected with scab as to make the crop unmarketable, and in consequence the cultivation of the crop had been abandoned. The soil is a very light sand, inclined to blow at times. The application of wet sawdust, and especially of a combination of wet sawdust and salt, had the effect of producing a crop of Potatoes almost free from scab, as will be seen from the accompanying photograph. None of the other substances appreciably diminished the amount of scab (Report No. 63).

In 1907 the experiment was repeated at Garforth, on soil liable to produce scab, but to a less extent than the soil at Ellerker. Up-to-Date was the Variety planted, and the manuring was the same as for the Varieties. The following substances were used :—

1. 47 cwts. sawdust (wetted) per acre.
2. 47 „ „ „ and 5 cwts. salt per acre.
3. 20 „ peat-moss „ per acre.
4. 20 „ „ „ and 5 cwts. salt per acre.
5. Seed submerged 2 hours in a solution of formalin of the following strength, viz. : 8 fluid oz. of commercial formalin to 15 gallons of water.

The above quantities of sawdust and peat-moss were of equal cost, and the weights are in each case those of the dry material applied. Clean seed was planted on each plot.

The tubers grown on the untreated plot exhibited the most scab, but there was little difference in this respect between the untreated plot and the peat-moss plots. In no case was scab present in such amount as seriously to depreciate the market value of the ware. The produce of the plot on which had been planted seed previously submerged in formalin, contained little scab, and the produce of the sawdust plots was practically clean. The salt, however, had materially reduced the yield of the crop.

Sawdust, for some reason or other, undoubtedly checks the development of scab on the tubers, but the theory that this is largely due to its increasing the water holding capacity of the soil is not strengthened by the results of the experiment 1907. During the entire growing period the rainfall was abnormally heavy, and the plants at no time lacked a plentiful supply of moisture, yet the amount of scab on the untreated plot was quite as great as it has been on the same class of soil in previous dry years.

Most authorities attribute scab to the parasitic fungus —*Oospora scabies*, Thaxter. If this be so, the beneficial effect of sawdust may to some extent be due to the protection which a covering of this material affords the tubers against the attacks of the scab-producing fungus.

In order to ascertain, if possible, whether scab was due to a fungus the following experiment was conducted at Garforth in 1907 :—

A quantity of soil was obtained from the field at Ellerker, already referred to as being one on which the growing of Potatoes had to be abandoned on account of the extraordinary extent to which Potato

tubers became scabbed. Soil, sufficient to fill two wooden buckets, was thoroughly sterilised by being heated with steam to 120°C. and kept at that temperature for fifteen minutes. Twenty minutes were taken to reach 120°C. This temperature is sufficient to kill fungi and all bacteria, with perhaps one or two possible exceptions.

When the soil had cooled, the buckets were sunk in a plot in the garden, and a tuber of Up-to-Date was planted in each. The tubers had been previously submerged for 2 hours in a solution of formalin of the following strength :—8 fluid oz. of commercial formalin to 15 gallons of water.

Two similar buckets were likewise filled with part of the same soil, unsterilised, and a tuber of Up-to-Date, previously treated with formalin solution, was planted in each. The buckets were then sunk in the garden, beside the first two.

Just before the tubers were planted, each bucket received a teaspoonful of artificial manure mixed in the following proportions :—

1 part Sulphate of Ammonia.
2 parts Superphosphate.
1 part Sulphate of Potash.

It was early seen that this experiment, in addition to the possibility of its helping to solve the problem as to the cause of scab, was to lead to other important results. Throughout the entire period of growth the haulm of the potatoes grown in the sterilised soil was markedly more vigorous than that of the potatoes grown in the unsterilised soil, and when the crops were raised in Autumn the following weights of produce were obtained :—

	Sterlised Soil.	Unsterilised Soil.
	lb. oz.	lb. oz.
Lifted on Oct. 11th, 1 bucket =	2 2	1 4
Lifted on Nov. 2nd, 1 „ =	4 0	1 4

The accompanying photograph shows the total produce lifted from the second pair of buckets on November 2nd.

It is difficult to explain this remarkable result. The experiment will have to be repeated and extended before any reliable conclusions can be drawn therefrom.

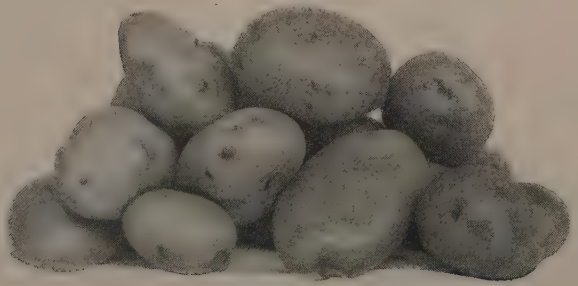
With regard to the problem which the experiment was designed to solve—viz, as to whether scab was caused by a fungus, it will be seen from the photograph that the potatoes from the sterilised soil are quite devoid of scab, whereas the tubers from the unsterilised soil are affected with it. The amount of scab present, however, is much less than was the case in 1905 and 1906, when Potatoes were grown on the field at Ellerker, from which soil for the bucket experiment was obtained.

On October 11th, when the produce of the first two buckets was lifted, scab was only beginning to develop. Every tuber from the unsterilised soil had at least one speck of scab, whilst in the case of the sterilised soil, every tuber was absolutely free from any trace of scab.

These facts certainly indicate that a fungus may be the cause of scab.

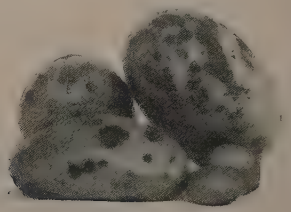
UP-TO-DATE.

STERILISED SOIL.



Weight, 4 lb.

UNSTERILISED SOIL.



1¼ lb.

SUMMARY.

The following conclusions are drawn from the experiments:—

1. Taking into account yield, cooking quality, and power of resisting disease, the following Varieties are well suited to cultivation in Yorkshire:—

   Earlies:—Midlothian Early, Ninety-Fold.

   Second Earlies:—British Queen No. 2, Dalmeny Radium.

   Main Crop Varieties:—Up-to-Date, and Varieties of that type, *e.g.*, Dalmeny Regent and Duchess of Cornwall.

2. Of disease-resisting Varieties, Northern Star and Professor Maercker (German) gave the most profitable results.

3. Seed from Scotland and Ireland has yielded much heavier crops at Garforth than seed introduced from another part of England.

   On the whole Irish Seed has given a better return than Scotch.

4. The vigour of the Potato has not been increased by growing the crop alternately on loamy and clay soil at Garforth.

5. A dressing of wet sawdust applied over the sets, at planting time, greatly reduced the amount of Potato scab.

6. Sterilisation of the soil had the effect of preventing scab; at the same time it greatly increased the yield of Potatoes.

J. G. STEWART.

The University,
Leeds, *February* 1*st*, 1908.

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